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Portland Bureau of Transportation Supplement to the Oregon Department of Transportation Standard Specifications for Microcomputer Signal Controller

Revised March 1, 2023

Modify and amend the most current published version of the ODOT Standard Specification for Microcomputer Signal Controller, including all published errata, on ODOT's Traffic Standards website with the following:

CHAPTER 1 **GENERAL SPECIFICATIONS FOR TRAFFIC SIGNAL CONTROL EQUIPMENT**

Replace Section 7, Unit 5 (1.7.5), with the following:

- 1.7.5.1 After successful testing of controller equipment, the Contractor shall pick up and install all tested equipment, except that the City of Portland shall have the option of providing all or selected cabinet control equipment as indicated on the plans. Successful completion of the ODOT test does not relieve the Contractor of equipment warranty obligations.
- 1.7.5.2 On project where the City of Portland provided controller equipment, the Contractor will pick up the equipment from the City and install the equipment on site.

CHAPTER 3



The Portland Bureau of Transportation fully complies with Title VI of the Civil Rights Act of 1964, the ADA Title II, and related statutes and regulations in all programs and activities. For accommodations, complaints and information, call (503) 823-5185, City TTY (503) 823-6868, or use Oregon Relay Service: 711.

SPECIFICATION FOR MODEL 200 SWITCH PACK,
MODEL 204 FLASHER UNIT,
AND MODEL 430 FLASH TRANSFER RELAY

Modify **SECTION 1 - GENERAL REQUIREMENTS** as follows:

- 3.1.6.1 Replace "15 amps" with "10 amps"

CHAPTER 5
SPECIFICATION FOR DETECTOR SENSOR UNITS, ELEMENTS,
ISOLATORS, AND DISCRIMINATORS

Replace the entire **SECTION 2 - MODEL 222 AND 222T LOOP DETECTOR UNIT REQUIREMENTS** with the following:

- 5.2.1 The loop amplifier shall have an LCD display at least 19.39 mm X 36.49 mm.
- 5.2.2 The LCD display shall provide for the following displays:
1. Sensitivity Level
 2. Actual loop frequency
 3. Delay time in seconds
 4. Extension time in seconds
 5. Display change in inductance during the "Call" state
 6. Display of the loop inductance during the "No-Call" state
- 5.2.3 The detector shall automatically tune and be operational within 2 seconds after application of power or being reset.
- 5.2.4 Detectors shall reach full sensitivity and hold within 30 seconds after application power or reset signal.
- 5.2.5 The detector shall be fully self-compensating for environmental changes and loop drift over the full temperature range and the entire loop inductance range.
- 5.2.6 The detector shall continue to operate with a point short to ground on the loop or loop lead-in. The detector shall tolerate, without damage, a 10 microfarad

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capacitor charged to 2000 volt being discharged between either loop terminal and earth ground. Should the total inductance of the loop input network go out of range specified for each detector channel, or rapidly changes by more than $\pm 25\%$, the detector shall immediately enter the fail-safe mode and display Loop Fail on the front panel. The type of loop failure shall be displayed indicating open loop or shorted loop conditions. The condition shall continue as long as the fault exists. The fail-safe mode shall generate a continuous call in Presence Mode and no calls in Pulse Mode. When the loop is functional, the loop fail message on the front panel shall extinguish and the channel will resume normal operation. Each loop failure shall be accumulated and logged in to Loop Fail Memory.

5.2.7 The response time of the detector shall conform to table shown on typical response times.

5.2.7.1 Scanning:

5.2.7.1.1 The loops connected each detector channel shall activate alternately to minimize cross talk between adjacent loops.

5.2.7.1.2 Typical scanning response times shall not exceed the following:

SENSITIVITY	RESPONSE (MILLISECONDS)
1	2
2	2
3	4
4	8
5	16
6	32
7	65
8	130
9	260

5.2.7.2 Non-Scanning:

5.2.7.2.1 The loops connected to each detector channel shall continuously be activated.

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5.2.7.2.2 Typical non-scanning response times shall not exceed the following:

SENSITIVITY	RESPONSE (MILLISECONDS)
1	1
2	1
3	2
4	4
5	8
6	16
7	32
8	65
9	130

5.2.8 All detector setting shall be operator settable from the front panel.

5.2.8.1 The detector shall provide 8 selectable loop frequency settings per channel in the range of 20 to 100 Kiloherzt. These settings shall be programmable from the front panel. LCD shall display the loop frequency for each channel on the front panel.

5.2.8.2 The detector shall provide 9 sensitivity levels for each channel, plus Continuous Call and Channel-Off.

5.2.8.2.1 The sensitivity levels shall correspond to the following ranges of changes in inductance:

SENSITIVITY AND DELTA L/L

SENSITIVITY	DELTA L/L
Off	—
1	0.64%
2	0.32%
3	0.16%
4	0.08%
5	0.04%
6	0.02%

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7	0.01%
8	0.005%
9	0.0025%
Call	—

- 5.2.8.2.1.1 When the detector is set to the Continuous Call state, the channel output will be continuously in the call state regardless of the presence or absence of vehicles over the loop. The option shall be selectable from the sensitivity menu.
- 5.2.8.2.1.2 When the detector is set to the Channel Off state, the channel output is continuously in the No-Call state regardless of the presence or absence of vehicles over the loop.
- 5.2.8.3 The detector delay timer will be adjustable from 0 to 255 seconds in 1-second increments (per channel). The Call Delay timer shall be displayed on the front panel and will start counting down when a vehicle enters the loop detection zone. The detector extension timer shall be adjustable from 0 to 25.5 seconds in 0.1 increments (per channel). Extension timer shall be displayed on the front panel and will start counting down when the last vehicle leaves the loop detection zone. Any vehicle entering the loop detection zone during the extension time period shall cause the channel to return to the detect state, and later, when the last vehicle leaves the loop detection zone, the full extension time starts count down again.
- 5.2.8.4 The detector shall display the total loop inductance on the front panel LCD for each channel (actual Loop Inductance plus actual lead in inductance) in microhenries with an accuracy of $\pm 15\%$ for loop inductance with values less than 700 microhenries.
- 5.2.8.5 The detector shall display the loop's delta L/L value on the front panel LCD as a percentage change for each channel (where L is the actual loop inductance plus actual loop lead-in inductance) during the Call State.
- 5.2.9 The detector shall have two exclusive modes of operation for each channel.
- 5.2.9.1 Pulse Mode:
- 5.2.9.1.1 The detector shall have a pulse of 125 ± 10 milliseconds duration generated for each vehicle entering the loop detection zone. Each detected vehicle is

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automatically tuned out if it remains in the loop detection zone more than 2 seconds. After each vehicle leaves the loop detection zone, the channel shall be capable of detecting another vehicle entering the zone of detection.

5.2.9.2 Presence Mode:

5.2.9.2.1 The detector shall have a call hold time of 4 minutes minimum regardless of vehicle size and typically 1 to 3 hours for an automobile or truck. The detector amplifier shall be capable of operating in either a scanning and non-scanning mode.

5.2.10 The detector shall provide an option for "tuning out" adjacent lane pick or loop drift. The detector shall provide an option of logic generated outputs for queued vehicles and direction detection. The detector shall provide an option for directional detection.

5.2.11 The amplifier units shall pass operational performance testing by the City of Portland.

Add the following Section 5 to Chapter 5:

SECTION 5 - OPTICOM DISCRIMINATOR UNIT REQUIREMENTS

5.5.1 The Model 762 and 764 discriminators and all cable and installation hardware as required shall be "Opticom" brand, manufactured by Global Traffic Technologies.

CHAPTER 6

SPECIFICATIONS FOR CABINET MODEL 332, 334 AND 340

Modify **SECTION 1 - GENERAL REQUIREMENTS AND CABINET MODEL COMPOSITION** as follows:

6.1.1 Add a 203mm bolted riser frame and a rack mounted communications terminal block.

6.1.1.1 Add the following to the listed items: Auxiliary output file

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6.1.1.2 Add the following to the listed items: Auxiliary output file

6.1.1.4 In the first sentence, remove "with Model 400 Modem".

Modify or replace portions of **SECTION 2 - HOUSING REQUIREMENTS** as follows:

6.2.1 Delete the Police Panel and add a 203mm bolted riser frame and communications terminal rack.

6.2.3.3 When the door is closed and latched, the door shall not be locked. The door locks shall be padlocks on the latching handle. The handles shall be on the right side of the front door and the left side of the rear door. Door lock holes, if present, shall be securely sealed with watertight stainless steel plugs (Hoffman A-S 100SS or an approved equal).

6.2.3.4 The padlocks shall be Best Company Padlocks 21B722-L-606 Series (or an approved equal) with green construction cores. Two keys shall be supplied with each cabinet. The keys shall be removable in the locked position only.

6.2.6 **Police Panel** (Delete the entire section. If a police panel is present the door shall be bolted securely shut with stainless steel hardware and all police panel switches shall be disconnected.)

Add the following:

6.2.8 **Riser Frame**

6.2.8.1 An 8" high aluminum bolted riser frame as shown on ODOT Standard Drawing Number TM423 shall be provided with each cabinet.

Modify portions of **SECTION 4 - CABINET ASSEMBLY REQUIREMENTS** as follows:

6.4.1.4.1.7 Add the following sentence: The guides shall be plastic.

6.4.2.5.7.1 Replace all with the following:

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The Model 206 Power Supply Module shall comply with the California Department of Transportation TEES 2009 model 206L.

Modify, add or replace portions of **SECTION 5 - CABINET WIRING REQUIREMENTS** as follows:

- 6.5.2.1 Replace the last sentence with the following:
All spade connectors on wires connecting to the input panel (terminal blocks TB1 through TB10 and DC ground bus) and/or input files (terminal blocks T1 through T15) shall be crimped and soldered to the wires.
- 6.5.6 **Detector Test Buttons** (Delete the entire section. The City of Portland does not require detector test buttons.)

Add the following to **SECTION 5 - CABINET WIRING REQUIREMENTS**:

- 6.5.1.4 An electronic version of the cabinet wiring diagram in ".dgn" format shall be provided with the controller.
- 6.5.2.8.1 Two 10 position or one 20 position AC- terminal bus shall be installed in the cabinet.
- 6.5.7 **Rack Mounted Communication Panel**
 - 6.5.7.1 Furnish and install quick telephone - Type 66 termination blocks of the type manufactured by Siemon or Reliance or an approved equivalent, for terminating #22 AWG communications cable and an eight position isolated open faced barrier strip. The termination block shall be six rows across by twenty five rows long and shall not require standoff brackets to be mounted. The barrier strip shall be an 8 position terminal block with 8/32 by 1.11mm (7/16") nickel plated brass binder head screws and nickel plated brass inserts. The blocks shall be mounted on a 140 mm wide aluminum recessed communications terminal panel attached between the uprights of the cabinet cage supports in the top section of the rear of the cabinet.

CHAPTER 7
SPECIFICATIONS FOR CABINET MODEL 336, 336S AND 344

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Modify **SECTION 1 - GENERAL REQUIREMENTS AND CABINET MODEL COMPOSITION** as follows:

- 7.1.1 Add a rack mounted communications terminal block.
- 7.1.1.1 Add the following to the listed items: Auxiliary output file
- 7.1.1.2 Add the following to the listed items: Auxiliary output file
- 7.1.1.4 In the first sentence, remove "with Model 400 Modem".

Modify or replace portions of **SECTION 2 - HOUSING REQUIREMENTS** as follows:

- 7.2.1 Delete the Police Panel and add a communications terminal rack.
- 7.2.3.3 When the door is closed and latched, the door shall not be locked. The door locks shall be padlocks on the latching handle. The handles shall be on the right side of the front door and the left side of the rear door. Door lock holes, if present, shall be securely sealed with watertight stainless steel plugs (Hoffman A-S 100SS or an approved equal).
- 7.2.3.4 The padlocks shall be Best Company Padlocks 21B722-L-606 Series (or an approved equal) with green construction cores. Two keys shall be supplied with each cabinet. The keys shall be removable in the locked position only.
- 7.2.6 Police Panel (Delete the entire section. If a police panel is present the door shall be bolted securely shut with stainless steel hardware and all police panel switches shall be disconnected.)

Add portions of **SECTION 4 - CABINET ASSEMBLY REQUIREMENTS** as follows:

- 7.4.1.4.1.7 Add the following sentence: The guides shall be plastic.

Add, modify, or replace **SECTION 5 - CABINET WIRING REQUIREMENTS** as follows:

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- 7.5.1.4 An electronic version of the cabinet wiring diagram in “.dgn” format shall be provided with the controller.
- 7.5.2.1 Replace the last sentence with the following:
All spade connectors on wires connecting to the input panel (terminal blocks TB1, TB2, and DC ground bus) and/or input files (terminal blocks T1 through T15) shall be crimped and soldered to the wires.
- 7.5.6 **Detector Test Buttons** (Delete the entire section. The City of Portland does not require detector test buttons.)
- 7.5.7 **Rack Mounted Communication Panel**
- 7.5.7.1 Furnish and install quick telephone - Type 66 termination blocks of the type manufactured by Siemon or Reliance or an approved equivalent, for terminating #22 AWG communications cable and an eight position isolated open faced barrier strip. The termination block shall be six rows across by twenty-five rows long and shall not require standoff brackets to be mounted. The barrier strip shall be an 8 position terminal block with 8/32 by 1.11mm (7/16”) nickel-plated brass binder head screws and nickel-plated brass inserts. The blocks shall be mounted on a 140mm wide aluminum recessed communications terminal panel attached between the uprights of the cabinet cage supports in the top section of the rear of the cabinet.

Add/Replace Chapter 9 as follows:

CHAPTER 9
SPECIFICATIONS FOR MODEL 2070 CONTROLLER UNIT

SECTION 1 – GENERAL REQUIREMENTS

- 9.1.1 **Unit Chassis**
- 9.1.1.1 The 2070L Controller shall consist of a 2070 Chassis meeting the following requirements:

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1. Lite Cage
2. 2070-1E CPU Module
3. 2070-2E C1 and C11 Field I/O Connector Module
4. 2070-4A or 4B Power Supply Module
5. 2070-3B 8x40 LCD Heated Display
6. Two (2) - 2 MB Data Keys
7. 2070-6B Modem

9.1.2 **Controller and Module**

9.1.2.1 The 2070L Controller and module shall meet the following specifications:

1. Caltrans 2009 TEES, March 12, 2009.
4. Caltrans 2009 TEES Errata 1, January 21, 2010.
4. OS-9 Operating System version 3.3 (Ethernet Capable)
5. Controller Boot Code Compatible with NW Signal Voyage Controller Firmware and all included features
6. Tested and approved Boot Codes are:
 - a. Econolite - Boot Code V1.3.0.0.923 or later approved version.
 - b. Simens/Eagle - Boot Code 7.0.0.0.19 or later
 - c. McCain - Boot Code 1.1.0.4.0.0

9.1.2.2 The City of Portland's current version of NWS Voyage Software shall be installed at the Traffic Systems Service Unit of the Oregon Department of Transportation.

Add the following Chapter 12:

CHAPTER 12
SPECIFICATIONS FOR CABINET MODEL 337

SECTION 1 - GENERAL REQUIREMENTS AND CABINET MODEL COMPOSITION

12.1.1 **Unless otherwise specified**, the model shall be furnished, ready for operation, with the following composition:

12.1.1.1 A Model 337 Intersection Cabinet shall consist of:

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Housing (337)	C1 Harness
Power Distribution Assembly	C2 Harness
Input File	Service Panel
Output File	Communications Terminal Rack
DIN Rail Mounted Auxiliary Relay Socket	

- 12.1.1.2 The controller unit with Model 400 Modem shall be furnished with the Model 337 cabinet. The cabinet shall have all input and output files installed and wired complete for 4-phase operation. However, only those input and output devices, such as detector sensor units, isolator units, and switch packs necessary to provide the operation required by the plans or specifications shall be furnished.
- 12.1.1.3 A heavy-duty side-opening clear plastic pouch shall be furnished. The pouch shall be mounted on the front door of the cabinet and provide easy access and storage of the wiring diagrams.
- 12.1.1.4 Cabinet model interface wiring shall be per specified C1 Harness, detailed wiring lists, and required cabinet wiring diagram.
- 12.1.2 **Cabinet Shipping Requirements**
- 12.1.2.1 The cabinet shall be delivered mounted on a plywood shipping pallet. The pallet shall be bolted to the cabinet base. The cabinet housing doors shall be blocked to prevent movement during transportation.
- 12.1.3 **Cabinet Finish**
- 12.1.3.1 Inside and outside of walls, doors, and ceiling of the cabinet shall be anodized after fabrication.
- 12.1.3.2 All nuts, bolts, washers, screws [4 mm (or larger)], hinges, and hinge pins shall be stainless steel unless otherwise specified.
- 12.1.3.3 A clear area for the controller unit shall be provided in Model 337 cabinets. The area shall extend 38 mm in front of and 406 mm behind the front EIA mounting angles. A minimum of 184 mm above the supporting portion of the angle shall be kept clear for the controller.

- 12.1.3.3 All conductors, terminals, and parts that could be hazardous to maintenance personnel shall be protected with suitable insulating material.

SECTION 2 - HOUSING REQUIREMENTS

- 12.2.1 **The housing** shall include, but not be limited to the following:

Enclosure	Communications Terminal Rack
Doors	Ventilation
Latches/Locks	Gaskets
Hinges and Door Catches	Light Fixture

12.2.2 Housing Construction

- 12.2.2.1 The housing shall be rainproof with the top of the enclosure crowned to prevent standing water. It shall have single front and rear doors.
- 12.2.2.2 The enclosure including doors, lifting eyes, gasket channels, police panel (where furnished) and all supports welded to the enclosure and doors shall be fabricated of 3.2 mm minimum thickness, aluminum sheet alloy 5052-H32 or 6061-T6. Bolted-on supports shall either be the same material and thickness as the enclosure.
- 12.2.2.3 All exterior seams for enclosure and doors shall be continuously welded and shall be smooth. All edges shall be filed to a radius of 0.8 mm, minimum. ER5356 aluminum alloy bare welding electrodes conforming to AWS A5.10 requirements shall be used for welding on aluminum. Procedures, welders, and welding operators shall conform to the requirements and practices on AWS B3.0 and C5.6 for aluminum.
- 12.2.2.4 Aluminum surfaces shall conform to the following:
- 12.2.2.4.1 An anodic coating shall be applied to the aluminum surface after the surface has been cleaned and etched. The cleaning procedure shall be to immerse in inhibited alkaline cleaner [Oakite 61A, Diversey 909 (or equivalent) in mix of 45 to 60 g per liter of distilled water] at 71°C for 5 minutes. Rinse in cold water. The etching procedure shall be to immerse in a sodium solution [3.7 g sodium fluoride plus 37.5 g sodium hydroxide mix per liter of distilled water] at 66°C for 5 minutes. Rinse

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in cold water. Desmut in a 50% by volume nitric acid solution at 20°C for 2 minutes. Rinse in cold water.

- 12.2.2.4.2 The anodic coating shall conform to MIL-A-8625C (Anodic Coatings for Aluminum and Aluminum Alloys) for Type II, Class I Coating except the outer housing surface coating shall have a 0.018 mm minimum thickness and a 20 mg per 500 mm² minimum coating weight. The anodic coating shall be sealed in a 5% aqueous solution (pH 5.0 to 6.5) of nickel acetate at 99°C for 15 minutes.
- 12.2.2.5 The enclosure doorframes shall be double flanged out on all four sides and shall have strikers to hold tension on and form a firm seal between the door gasket and the frame. The dimension between the door edge and the enclosure external surface when the door is closed and locked shall be 4 (±2) mm.
- 12.2.2.6 Gaskets shall be provided on all door openings and shall be dust-tight. Gaskets shall be 6 mm minimum thickness, closed cell neoprene or silicone [BOYD R-10480 (or equal)] and shall be permanently bonded to the metal. If neoprene is used, the mating surface of the gaskets shall be covered with a silicone lubricant to prevent sticking to the mating metal surface. A gasket top channel shall be provided to support the top gasket on the door (prevents gasket gravitational fatigue).
- 12.2.2.7 The cabinet base layout shall accommodate a standard 101.6mm pedestal slipfitter. The cabinet shall provide sufficient resistance to flexing and eventual metal fatigue at the mounting point. The cabinet shall be supplied with a bolt on adapter for the bottom of the cabinet. The adapter shall provide for the adaption of the 101.6mm pedestal slipfitter to a 63.5mm conduit mount for pole mounting.
- 12.2.2.8 The cabinet shall be designed to allow for pole mounting. The cabinet shall provide sufficient resistance to flexing and shall withstand pole mounting without warping the cabinet. The cabinet shall be supplied with all required mounting accessories for mounting the cabinet to standard signal poles and pedestals.
- 12.2.2.9 All exterior bolt heads shall be tamperproof type.
- 12.2.2.10 Rails shall be provided both front and rear, as an integral part of the cabinet. The rails shall extend the full height of the cabinet and shall conform to the dimensional requirements of Standard EIA RS-310-C. Equipment mounting holes shall be provided with 10-32 threads and shall be located to secure equipment provided.

12.2.3 **Door Latches and Locks**

- 12.2.3.1 The latching handles shall have provision for padlocking in the closed position. Each handle shall be 20mm minimum diameter stainless steel rod. The padlocking attachment shall be placed at 100 mm from the handle shank center. An additional 100mm minimum gripping length shall be provided.
- 12.2.3.2 The latching mechanism shall be a 3-point draw roller type. The pushrods shall be 9.5mm minimum diameter stainless steel rods.
- 12.2.3.3 When the door is closed and latched, the door shall not be locked. The door locks shall be padlocks on the latching handle. The padlocks shall be Best Company Padlocks 21B722-L-606 Series (or an approved equal) with green construction cores. Two keys shall be supplied with each cabinet. The keys shall be removable in the locked position only. The handles shall be on the right side of the front door and the left side of the rear door. Door lock holes, if present, shall be securely sealed with watertight stainless steel plugs (Hoffman A-S 100SS or an approved equal).
- 12.2.3.4 The center latch cam shall be fabricated of 4.8mm minimum thickness stainless steel.
- 12.2.4 The general requirements for housing ventilation including intake, exhaust, filtration, fan assembly, and environmental control, as follows:
 - 12.2.4.1 The front door shall be provided with louvered vents. The louvered vent depth shall be a maximum of 6 mm. A removable air filter shall be housed behind the door vents. The filter filtration area shall cover the vent opening area. A filter shell shall be provided that fits over the filter, providing mechanical support for the filter. The shell shall be louvered to direct the incoming air downward. The shell sides and top shall be bent over a minimum of 5 mm to house the filter. The filter and shell shall be held firmly in place with a bottom bracket and a spring-loaded upper clamp. No incoming air shall bypass the filter. The bottom filter bracket shall be formed to create a waterproof sump with drain holes to the outside housing.
 - 12.2.4.1.1 The filter shall be 152 mm high by 406 mm wide by 22 mm thick. The filter shall trap particles 2 microns and larger.

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- 12.2.4.2 The intake (including filter with shell) and exhaust areas shall pass a minimum of 0.74 m³ of air per minute.
- 12.2.4.3 The housing shall be equipped with an electric fan with ball or roller bearings and a capacity of at least 2.8 m³ of free air delivery per minute. The fan shall be mounted within the housing and vented.
- 12.2.4.4 The fan shall be thermostatically controlled and shall be manually adjustable to turn on between 33°C and 65°C with a differential of not more than 6°C between automatic turn on and off. The fan circuit shall be protected at 125% of the fan motor ampacity. The manual adjustment shall be graded in 10° increments.

12.2.5 **Hinges and Door Catches**

- 12.2.5.1 Hinges with 2 bolts per leaf shall be provided to bolt the door to the enclosure. Each door shall have 3 stainless steel hinges. Each hinge shall be 90mm minimum length and have a fixed pin. The pin ends shall be welded to the hinge and ground smooth.
- 12.2.5.2 Front and rear doors shall be provided with catches to hold the door open at both 90° and 180° (plus or minus 10°). The catches shall be 6mm minimum diameter stainless steel rods. The catches shall be capable of holding the door open at 90° in a 95 km/hr wind, acting at an angle perpendicular to the plane of the door.

12.2.6 **Police Panel**

- 12.2.6.1 If a police panel is present the door shall be bolted securely shut with stainless steel hardware and all police panel switches shall be disconnected.

12.2.7 **Cabinet Light Fixture**

- 12.2.7.1 An 8-watt, self-starting fluorescent cabinet light shall be installed in each controller cabinet (see Cabinet Details Drawings). The fixture shall be mounted to the cabinet exhaust area cover plate by screw and self-locking nut. The mounting hardware shall not penetrate the exterior of the cabinet shell. The fixture and fluorescent tube shall not interfere with access to any cabinet component or TBK. The fixture will be controlled from a door-operated switch located at the rear door. The fixture

power shall be switched "ON" when the rear door is opened. In addition to the rear door switch, the fixture circuit shall incorporate an accessible power "ON-OFF" switch. Power for the light fixture shall be supplied from the load side of the 15 amp Equipment breaker of the PDA through an "in-line" type fuse holder (1 amp fuse) through the normally closed cabinet rear door switch to the light fixture (see Equipment Mounting Drawings).

SECTION 3 - CABINET ASSEMBLY REQUIREMENTS

12.3.1 Rack Assembly

12.3.1.1 The rack assembly shall be self-supporting and shall allow a free space beneath the lowest horizontal surface and between the side panels of 432mm wide by 406mm deep by 229mm high with both cabinet doors closed. The assembly shall be equipped with mounting ears to allow mounting of Standard EIA rails. Overall width of the assembly shall conform to Standard EIA RS-310-C. Two supports shall be supplied to support the controller unit. The supports shall be designed to support a minimum of 23 kg each. The horizontal side of each support shall be a minimum of 75 mm.

12.3.1.2 The rack assembly shall provide for a Model 204 Flasher, an input file to support 11 input slots, an auto/flash switch, a flash relay, three flash transfer relays, a power distribution assembly, a model 210 conflict monitor and 6 load switches.

12.3.1.2.1 Socket types for the following equipment shall be:

Switch Pack	BEAU S-5412-XX (or equal)
Heavy Duty Relay	BEAU S-5408-XX (or equal)
Flasher Unit	BEAU S-5406-XX (or equal)
210 Monitor Unit	PCB 28/56S
Power Distribution Assembly	BEAU S-5413-XX (or equal)
Auxiliary Relay Socket	PB 27E891

12.3.1.2.2 Connector sockets for flasher unit, power supply, and switch pack modules shall be mounted so that the front face of all plug-in assemblies shall be flush with the front face of the rack assembly. The sole exception shall be the flash relay, which may be mounted with its socket on the same plane as the flash transfer relay sockets.

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- 12.3.1.2.3 The Auxiliary Relay Socket shall be mounted on a 102mm section of DIN Rail Track attached on the left lower portion of the rack assembly as viewed from the back door.
- 12.3.1.3 The front face of the rack assembly may be inset from the EIA rails a maximum of 13mm.
- 12.3.1.4 The rack assembly depth shall not exceed 330mm from the front surface of the front EIA rails. Assembly or file depth dimension shall include TBKs.
- 12.3.1.5 Guides (top and bottom) shall be provided for switch pack modules, flasher units, monitor unit, detector and isolator modules. The guides shall begin 25 (plus or minus 13) mm in from the front panel surface and extend to within 13 mm of the connector socket face.
- 12.3.1.6 All fuses, circuit breakers, switches (except police panel switches, fan fuse and cabinet light fuse) and indicators shall be readily visible and accessible when the cabinet front door is open.
- 12.3.1.7 All equipment in the cabinet, when required shall be permanently and clearly labeled. The marker strips shall be made of material that can be easily and legibly written upon using a pencil or ballpoint pen. Marker strips shall be located immediately below the item they are to identify and must be clearly visible with all items installed.
- 12.3.1.8 Assemblies and files shall be fabricated of 1.5 mm minimum thickness aluminum or stainless-steel sheet. The metal surface shall be treated with clear chromate.
- 12.3.1.9 Resistor-capacitor transient suppression shall be provided at all AC relay sockets (across relay coil) except for the flash transfer relays (FTR) in the output files, where one suppression device may be common for all.
- 12.3.1.10 A leakage resistor which permits a small amount of current to pass through the heavy-duty relay coil, shall be installed across the terminals of relay sockets to overcome the residual magnetism.

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12.3.1.11 All assemblies and files shall allow air circulation through the top and bottom unless specifically called out otherwise.

12.3.2 **Input File** (Model 337 Cabinets)

12.3.2.1 The file shall have a maximum depth of 215 mm and shall intermate with and support 11, 2-channel detector or isolator units supported top and bottom with plastic guide rails.

12.3.2.2 The file shall provide a PCB 22/44S connector which shall be a DALE EB7CS22GY (or equal) and shall be centered vertically for each 2-channel detector. The associated number and letter side connectors shall be shorted internally. Pins D, E, F, J, K L, and W shall be brought out to an 8-position TBK on the back of the file. The output emitters shall be common grounded with the ground terminating at TB 15, position 4. Position 8 of the TBK is assigned to EG and is used to terminate lead-in shields.

12.3.2.3 The input file shall be provided with marker strips to identify isolators and detectors in the file.

12.3.2.4 TBK terminal screw size shall be 8-32.

12.3.2.4 TB2, TB3, TB4 and TB5 shall be provided and mounted vertically and parallel to the cabinet sides. In viewing from the back door, TB2 and TB3 shall be mounted on the right side of the cabinet and connected to input file slots 1-3 and 4-5. In viewing from the back door, TB4 and TB5 shall be mounted on the left side of the cabinet and connected to input file slots 6-8 and 9-11.

12.3.2.5 Each detector lead-in pair from the field terminals to the input file terminals, shall be a cable of IMSA Type 50-2 (or better). The stranded, tinned, copper drain wire shall be connected to the "L" terminal on the input file TBKs. This input terminal shall be connected to the equipment grounding bus through a single conductor. Each connection shall be made by using a crimp connector that is soldered after the connector is crimped to the wire. These cables shall be heat shrunk protected - both the drain wire and the foil shield, to prevent shorting against the contacts on the back of the input file.

12.3.3 **Output File** (Model 337 Cabinets)

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- 12.3.3.1 The Output File shall be capable of containing six Model 200 switch packs, three Model 430 Flash Transfer Relays, one Model 210 Monitor Unit and one Flash Relay. The construction plans shall determine the number of flash transfer relays and switch packs that will be furnished with the output file.
- 12.3.3.2 The output file shall be provided with marker strips to identify switch packs when mounted in the file.
- 12.3.3.3 The depth of the file shall not exceed 368 mm.
- 12.3.3.4 Switch pack connectors, monitor unit connectors, flash transfer relay sockets, and flash programming connectors shall be accessible from the back of the output file without the use of tools or removal of any other equipment.
- 12.3.3.5 TBK 01 terminal screw size shall be 8-32.
- 12.3.3.6 TBK 02 terminal screw size shall be 6-32.
- 12.3.3.7 Field wire TBKs shall be mounted vertically on the back of the assembly. The output file shall have 3 TBKs with 6 positions clearly labeled by both position number and function. Terminal position screw size shall be 10-32.
- 12.3.3.8 The flash programming connectors shall be Molex Type 1375 (or equal). The receptacle shall be mounted on the file with a programmable plug connected. The plug connector, with programming jumpers, shall be furnished for each circuit to allow red, yellow or pedestrian flash programming. Requirements are: 4 red, 3 yellow and 3 pedestrian plug connectors. Connectors shall be readily accessible without the removal of any other equipment. Plug pins shall be crimped and soldered.
- 12.3.3.7 Output file connectors and sockets shall be hand wired; printed circuit boards will not be acceptable for current carrying circuits.
- 12.3.3.8 The monitor unit connector shall be a rigidly supported printed circuit board edge connector, having 2 rows of 28/56 independent double readout bifurcated contacts on 0.156 inch centers. The CMU connector shall be mounted on a printed circuit board that provides the capability of changing the channel assignments by wire jumper. Jumper wires shall be installed to enable the pedestrian switch pack

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centers to be used as shown on the plans. The connector shall intermate with the monitor unit.

12.3.3.9 It shall be possible to remove the Model 210 monitor unit without causing the intersection to go into flashing operation. The cabinet shall be wired so that, with the front cabinet door closed and with the monitor unit removed, the intersection shall go into flashing operation.

12.3.3.10 The output file shall have plastic guide rails

12.3.4 **Power Distribution Assembly**

12.3.4.1 The power distribution assembly shall be completely removable from the cabinet without removing any other equipment and using only a slotted or Phillips screwdriver. The PDA shall be electrically and mechanically interchangeable with any 337 cabinet assembly unit.

12.3.4.2 The following equipment shall be provided with the power distribution assembly:

- 1 - 1 Pole, 30 amp, 120 VAC Main Circuit Breaker
- 1 - 1 Pole, 15 amp, 120 VAC Equipment Circuit Breaker
- 1 - 1 Pole, 30 amp, 120 VAC Signal Bus and Breaker
- 1 - 2 Pole Ganged, 20 amp, 120 VAC Flash Bus Circuit Breaker
- 1 - 24 VDC Power Supply
- 1 - Power Relay and Socket
- 1 - AUTO/FLASH Control Switch
- 1 - Signals/Off Switch
- 1 - FLASH On Indicator Light
- 1 - 13 Position Connector to intermate with rack assembly
- 2 - Test Points
- 2 - Power Supply Fuses (AC and DC)

12.3.4.3 Breaker ratings shall be shown on face of breaker or handle. Breaker function shall be labeled below breaker on front panel.

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- 12.3.4.4 The AUTO/FLASH switch, when placed in FLASH position (down), shall energize the power relay coil and apply a stop time to the controller. When the switch is placed in the AUTO position (up), the switch packs shall control the signal indications. The switch shall be a double-pole single-throw toggle control switch rated for 15 amperes at 120 volts AC
- 12.3.4.5 The Power Indicator, labeled "24 VDC PWR", shall be a 24 VDC lamp, Dialight 507 Series LED Cartridge Type 507-4761-3331-500 with Dialight Datalamp Cartridge Holder Type 508-8738-504 or equivalent. The lamp shall be tied across the Power supply output on the fused side.
- 12.3.4.6 The FLASH indicator light labeled "FLASH ON" shall be mounted on the PDA front panel. The Flash Indicator shall be a 120 VAC lamp, Dialight 507 Series Neon Cartridge Type 507-4537-0937-640 with Dialight Datalamp Holder Type 508-8745-504 or equivalent. The lamp shall be tied across the Power Relay coil.
- 12.3.4.7 The SIGNALS/OFF switch, when placed in the off position (down), shall energize the power relay coil and interrupt power to the flasher. The switch shall be a 3 pole double throw switch rated for 15 amperes at 120 volts AC. Two of the three poles shall be tied in parallel to provide sufficient switching capacity for flasher power.
- 12.3.4.8 All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the TBK on the common side, except for the AC power conductor between the service TBK and main circuit breaker. All internal conductors terminating at the blocks shall be connected to the other side of the blocks.
- 12.3.4.8 Equipment Circuit Breaker - A 15 amp, 120 volt AC circuit breaker shall be installed for equipment circuit protection. The breaker shall be placed on the load side of the main breaker. The breaker shall be located on the front panel of the PDA assembly next to the Main breaker.
- 12.3.4.9 Signal Bus Circuit Breaker - A 30 amp, 120 volt AC circuit breaker with medium trip delay characteristic shall be provided.
- 12.3.4.10 A power supply shall be provided to supply +24 VDC to the input and output files for use by their associated devices. The front panel shall include AC and DC fuses, "POWER ON" light, and test points for monitoring the output voltages. The power

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supply shall be of ferro-resonant design having no active components and will conform to the following requirements:

1. Line Regulation: 2% from 90 to 135 VAC at 60 Hz, plus an additional 1.6% for each additional 1% frequency change
2. Load Regulation: 5% from 1 amp to 5 amps with a maximum temperature rise of 30°C above ambient
3. Design Voltage: +24 (± 0.5) VDC at full load, 30°C, 115 VAC incoming after a 30 minute warm-up period
4. Full Load Current: 5 amps, minimum
5. Ripple Noise: 2 volts peak-to-peak and 500 mV RMS at full load
6. Line Voltage: 90 to 135 VAC
7. Efficiency: 70% minimum
8. Minimum Voltage: +22.8 VDC
9. Circuit capacitors shall be rated for 40 volts, minimum.

12.3.4.11 Two 0.5 Ω , 10 watt minimum, wire-wound power resistors with a 0.2 μ H inductance shall be provided; 1 on the AC+ power line and 1 on the AC- line. Three MOV surge arrestors rated for 20 Joules minimum, shall be provided between AC+ and EG, AC- and EG, and between AC+ and AC-. A 0.68 μ F capacitor shall be placed across AC+ and AC- between the 2 power resistors and the MOV's.

12.3.5 **Cabinet Harnesses** (337 Cabinet)

12.3.5.1 Connector C1P shall contain 104 pin contact positions and shall intermate with Connector C1S mounted on the controller chassis. Corner guide pins for connector C1P shall be stainless steel and shall be 27.9mm in length. Corner guide socket assemblies shall be stainless steel and shall be 15.9mm in length.

12.3.5.2 Connector C4 shall contain 24 contacts and shall be the circular plastic type with quick connect/disconnect capability and thread assist, positive detent coupling. The plug Connector C4 shall be mounted on the Rack Assembly.

12.3.5.3 Connector blocks for Connector C1 pin and socket connectors shall be constructed of diallyl phthalate or better. Contacts shall be secured in the blocks with springs of stainless steel.

12.3.5.4 All wires terminating in connectors, unless otherwise noted, shall be crimped or soldered.

12.3.6 **Rack Mounted Communications Panel**

12.3.6.1 Furnish and install quick telephone - Type 66 termination blocks of the type manufactured by Siemon or Reliance or an approved equivalent, for terminating #22 AWG communications cable and an eight-position isolated open-faced barrier strip. The termination block shall be six rows across by twenty-five rows long and shall not require standoff brackets to be mounted. The barrier strip shall be an 8-position terminal block with 8/32 by 1.11mm (7/16") nickel-plated brass binder head screws and nickel-plated brass inserts. The blocks shall be mounted on a 140mm wide aluminum recessed communications terminal panel attached between the uprights of the cabinet rack assembly in the lower section of the front of the cabinet.

SECTION 4 - CABINET WIRING REQUIREMENTS

12.4.1 **Cabinet Wiring Diagram**

12.4.1.1 The cabinet wiring diagram for Models 337 cabinets shall be furnished on current ODOT drawings for the appropriate cabinet model. One full-sized reproducible master copy of the drawing will be furnished, upon request.

12.4.1.2 The Contractor shall add to the drawing all information and details required giving an accurate description of the wiring and operation of each individual cabinet. The information required includes the following:

1. Software program number and C1 connector pin program assigned functions
2. Input file phase and loop number references
3. Output file phase references
4. Location and phase reference for all input/output devices furnished
5. Modifications made to standard cabinet wiring
6. Intersection layout
7. Phase sequence diagram

8. Preemption sequence diagram (if applicable)

12.4.1.3 The intersection layout shall include all vehicle signals, pedestrian signals, vehicle detectors, push buttons, lane usage arrows, and special devices located and identified as shown on the plans. A north arrow shall also be included and the intersecting streets shall be identified.

12.4.1.4 The phase and preemption sequence diagrams shall refer to the phase designations and sequence shown on the plans for both normal phase rotation and preemption.

Four OZALID-type (or equivalent) copies of the wiring diagram shall be furnished with each Model 337 controller cabinet. The copies shall not be reduced in size.

12.5.1.6 An electronic version of the cabinet wiring diagram in ".dgn" format shall be provided with the controller.

12.4.2 **Conductors** (Model 337 Cabinets)

12.4.2.1 All conductors used in cabinet wiring shall terminate with properly sized, insulated, spring spade type terminals except when soldered to a through-panel solder lug on the rear side of the TBK or as specified otherwise. All spade connectors on wires connecting the input panel to the input files shall be crimped and soldered to the wires.

12.3.2.2 All crimp-style connectors shall be applied with a tool that prevents opening of the handles until the crimp cycle is completed.

12.4.2.3 All conductor sizes shown are AWG.

12.4.2.4 Conductors between the service terminal AC- and EG and their associated bus, the EG bus conductor to power distribution assembly and cage rail, and the AC- bus to power distribution assembly shall be No. 10 (or larger).

12.4.2.5 All conductors, unless otherwise specified, shall be stranded No. 22 (or larger). Conductors shall be rated for 600 volts and shall conform to IMSA Specification 50-2 (or better). The insulation shall have a minimum thickness of

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10 mils and shall be Nylon-jacketed polyvinyl chloride, except that conductors No. 14 and larger may have Type THHN/THWN insulation.

- 12.4.2.6 All conductors, except those that can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor.
- 12.4.2.7 All conductors shall conform to the following color-code requirements:
1. The grounded conductors of AC circuits shall be identified by a continuous white or gray color.
 2. The equipment-grounding conductors shall be identified by a solid green color or by a continuous green color with one or more yellow stripes.
 3. The DC logic ground conductors shall be identified by a solid white color with a red stripe.
 4. The ungrounded conductors shall be identified by any color not specified in 1, 2, or 3 above.
- 12.4.2.8 All wiring harnesses shall be neat, firm, and routed to minimize crosstalk and electrical interference.
- 12.4.2.9 Wiring containing AC shall be routed and bundled separately or shielded separately from all logic voltage control circuits.
- 12.4.2.10 Cabling shall be routed to prevent conductors from being in contact with metal edges. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.
- 12.4.2.11 Within the cabinet, the DC logic ground and EG shall be electrically isolated from the AC grounded conductor and each other by 500 M Ω when tested at 250 volts DC, with the power line surge protector disconnected.
- 12.4.2.12 The AC copper terminal bus shall not be grounded to the cabinet or connected to logic ground. Nylon screws with a minimum diameter of 6mm shall be used for securing the bus to the service panel.

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12.3.2.13 An equipment grounding bus shall be provided in each cabinet. The bus shall be copper and connected to the cabinet chassis.

12.4.2.14 Each detector lead-in pair from the field terminals to the input file terminals, shall be a cable of IMSA Type 50-2 (or better). The stranded, tinned, copper drain wire shall be connected to the "L" terminal on the input file TBKs. This input terminal shall be connected to the equipment grounding bus through a single conductor. Each connection shall be made by using a crimp connector that is soldered after the connector is crimped to the wire. These cables shall be heat shrunk protected - both the drain wire and the foil shield, to prevent shorting against the contacts on the back of the input file.

12.4.3 **Terminal Blocks** (Model 337 Cabinets)

12.4.3.1 The TBKs shall be barrier type, rated at 20 amps, 600 volts RMS, minimum. The terminal screws shall be 7.9 mm minimum length, nickel-plated, brass binder head type with screw inserts of the same material. Screw size is called out under associated cabinet assembly, file or side panel.

12.4.3.2 The terminals of the power line service TBK shall be labeled "AC+", "EG", and "AC-" and shall be covered with an insulating material to prevent inadvertent contact. Terminating lugs large enough to accommodate No. 4 conductors shall be furnished for the service TBK. The AC+, AC-, and EG conductors connecting to the service terminals and appropriate busses shall not be spade lugged.

12.4.4 **Detector Test Buttons**

12.4.4.1 The City of Portland does not require detector test buttons.

12.4.5 **Auxiliary Relay Socket**

12.4.5.1 An auxiliary relay socket shall be mounted on a 102mm DIN rail attached to the left side of the rack assembly as viewed from the rear door. C1-100 shall be landed on position 2 of the socket and 24 VDC+ from TB02 position 1 shall be landed on position 7. This relay will be used for controlling auxiliary devices with an output from the controller.

SECTION 5 – CABINET TRANSIENT SURGE SUPPRESSION REQUIREMENTS

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12.5.1 **Power Line**

12.5.1.1 The power line surge protector shall be metal oxide varistor (MOV). One shall be installed between AC+ and EG and the other between AC- and EG. The MOV shall have the following ratings:

Recurrent peak voltage:	212 volts
Energy rating:	50 Joules, maximum
Power dissipation:	0.85 watt, average
Peak current for pulses:	2,000 amps for less than 6 μ S
Standby current:	Less than 1 mA

12.5.1.2 The power line surge protector shall also include a Three-Electrode Gas Tube Type and shall have the following ratings:

Impulse Breakdown:	less than 1,000 volts in less than 0.1 microseconds at 10 kilovolts/microsecond.
Standby Current:	less than one mA
Striking Voltage:	greater than 212 volts DC.

12.5.1.2.1 The three-electrode gas tube type surge protector shall be capable of withstanding 15 pulses of peak current each of which will rise in 8 microseconds and fall in 20 micro-seconds to one half the peak voltage at 3 minute intervals. Peak current rating shall be 20,000 Amps.

12.5.2 **Modem Interconnect Lines** (Model 337 Cabinets)

12.5.2.1 General Requirements:

1. Shall be installed in all cabinets
2. Shall suppress bipolar and bi-directional transients
3. Shall fail in the open circuit configuration
4. Shall be of solid-state design and contain no spark gap or gas tube
5. Leakage current to ground, maximum: 0.2 mA
6. Circuit impedance loading: $<25\Omega$

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12.5.2.2 TVSS Performance:

1. Rated single transient energy: 75 (10 x 100 μ S, Joules)
2. Single pulse transient current: 2,000(8 x 20 μ S, amps peak)
3. Maximum clamping voltage: 36(1 kV, 200 A 8 x 50 μ S, V peak)

12.5.2.3 Physical Characteristics:

1. Operating temperature: -34°C to 74°C
2. Dimensions, maximum: L 125 mm x W 100 mm x D 50 mm

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CITY OF PORTLAND 337 DETAIL #1

337 CABINET

222	222	222	222	222	222	242	252	222	242	562
PH.1 E & C C1-56	PH.2 E & C C1-39	PH.2 E & C C1-63	PH.3 E & C C1-58	PH.4 E & C C1-41	PH.4 E & C C1-65	PED 2 C1-67	OFFSET 1 C1-64	PH.5 E & C C1-59	PED INHIBIT C1-51	EVA C1-71
PH.1 E & C C1-60	PH.2 E & C C1-43	PH.2 E C1-76	PH.3 E & C C1-62	PH.4 E & C C1-45	PH.4 E C1-78	PED 4 C1-69	OFFSET 2 C1-77	PH.7 E & C C1-61	RR C1-52	EVB C1-72
1	2	3	4	5	6	7	8	9	10	11

INPUT FILE

PH 1	PH 2	PED 2	PH 3	PH 4	PED 4
C1-16	C1-12	C1-10	C1-7	C1-4	C1-2
C1-17	C1-13	C1-35	C1-8	C1-5	C1-37
C1-18	C1-15	C1-11	C1-9	C1-6	C1-3

RED

YELLOW

GREEN

CITY OF PORTLAND 337 DETAIL SHEET #2
TABLE OF PIN ASSIGNMENTS
MODEL 337 CABINET

<u>PIN</u>	<u>SOURCE</u>	<u>FUNCT.</u>	<u>CONN</u>	<u>PIN</u>	<u>SOURCE</u>	<u>FUNCT.</u>	<u>CONN</u>
1	DC=GND	L-GND	C4-2	53	12-7	IN 15	IF9-SP
2	O1-1	4P DW	C4-10	54	12-8	IN 16	IF6-SP3
3	O1-2	4P DW	C4-12	55	13-1	IN 17	NC
4	O1-3	4 RED	C4-19	56	13-2	IN 18	IF1-F
5	O1-4	4 YEL	C4-20	57	13-3	IN 19	NC
6	O1-5	4 GRN	C4-21	58	13-4	1N 20	IF4-F
7	O1-6	3 RED	C4-22	59	13-5	IN 21	IF9-F
8	O1-7	3 YEL	C4-23	60	13-6	IN 22	IF1-W
9	O1-8	3 GRN	C4-24	61	13-7	IN 23	IF9-W
10	O2-1	2P DW	C4-16	62	13-8	IN 24	IF4-W
11	O2-2	2P W	C4-18	63	14-5	IN 25	IF3-F
12	O2-3	2 RED	C4-13	64	14-6	IN 26	IF8-F
13	O2-4	2 YEL	C4-14	65	14-7	IN 27	IF6-F
14	DC-GND	L-GND	IF15-4	66	14-8	IN 28	NC
15	O2-5	2 GRN	C4-15	67	15-1	IN 29	IF7-F
16	O2-6	1 RED	C4-7	68	15-2	IN 30	NC
17	O2-7	1 YEL	C4-8	69	15-3	IN 31	IF7-W
18	O2-8	1 GRN	C4-9	70	15-4	IN 32	NC
19	O3-1	8P DW	NC	71	15-5	IN 33	IF11-F
20	O3-2	8P W	NC	72	15-6	IN 34	IF11-W
21	O3-3	8 RED	NC	73	15-7	IN 35	IF11-SP
22	O3-4	8 YEL	NC	74	15-8	IN 36	IF10-SP
23	O3-5	8 GRN	NC	75	16-1	IN 37	IF7-SP
24	O3-6	7 RED	NC	76	16-2	IN 38	IF3-W
25	O3-7	7 YEL	NC	77	16-3	IN 39	IF8-W
26	O3-8	7 GRN	NC	78	16-4	IN 40	IF6-W
27	O4-1	6P DW	NC	79	16-5	IN 41	NC

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TABLE OF PIN ASSIGNMENTS
MODEL 337 CABINET

<u>PIN</u>	<u>SOURCE</u>	<u>FUNCT.</u>	<u>CONN</u>	<u>PIN</u>	<u>SOURCE</u>	<u>FUNCT.</u>	<u>CONN</u>
28	O4-2	6P W	NC	80	16-6	IN 42	IF8-SP
29	O4-3	6 RED	NC	81	16-7	IN 43	C4-4
30	O4-4	6 YEL	NC	82	16-8	IN 44	C4-5
31	O4-5	6 GRN	NC	83	06-1	NA	NC
32	O4-6	5 RED	NC	84	06-2	NA	NC
33	O4-7	5 YEL	NC	85	06-3	NA	NC
34	O4-8	5 GRN	NC	86	06-4	NA	NC
35	O5-1	2P YEL	C4-17	87	06-5	NA	NC
36	O5-2	6P YEL	NC	88	06-6	NA	NC
37	O5-3	4P YEL	C4-11	89	06-7	NA	NC
38	O5-4	8P YEL	NC	90	06-8	NA	NC
39	I1-1	IN 1	IF2-F	91	07-1	NA	NC
40	I1-2	IN 2	IF2-SP	92	DC-GND	L-GND	C4-3
41	I1-3	IN 3	IF5-F	93	07-2	NA	NC
42	I1-4	IN 4	IF4-SP	94	07-3	NA	NC
43	I1-5	IN 5	IF2-W	95	07-4	NA	NC
44	I1-6	IN 6	NC	96	07-5	NA	NC
45	I1-8	IN 7	IF5-W	97	07-6	NA	NC
46	I1-8	IN 8	NC	98	07-7	NA	NC
47	I2-1	IN 9	NC	99	07-8	NA	NC
48	I2-2	IN 10	NC	100	05-5	Aux Rel Socket	Pin2
49	i2-3	IN 11	NC	101	05-6	FLASH	C4-1
50	I2-4	IN 12	NC	102	05-7	DET. RESET	IF15-3
51	I2-5	IN 13	IF10-F	103	05-8	WATCH DOG	C4-6

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CITY OF PORTLAND 337 DETAIL SHEET #2
TABLE OF PIN ASSIGNMENTS
MODEL 337 CABINET

<u>PIN</u>	<u>SOURCE</u>	<u>FUNCT.</u>	<u>CONN</u>	<u>PIN</u>	<u>SOURCE</u>	<u>FUNCT.</u>	<u>CONN</u>
52	I2-6	IN 14	IF10-W	104	DC-GND	L-GND	IF15-4

NA = NOT ASSIGNED NC = NO CONNECTION IF = INPUT FILE CONNECTOR

CITY OF PORTLAND 337 DETAIL SHEET #3
CONNECTOR PIN ASSIGNMENTS
CABLE C4

<u>PIN</u>	<u>SOURCE</u>	<u>DEST.</u>
1	C 1-101	FR COIL
2	C 1-1	TB 02-2
3	C 1-92	TB 02-2
4	C 1-81	IR-N.O.
5	C 1-82	MU-BB
6	C 1-103	MU-22
7	C 1-16	SWPK1-6
8	C 1-17	SWPK1-8
9	C 1-18	SWPK1-10
10	C 1-2	SWPK6-6
11	C 1-37	SWPK6-8
12	C 1-3	SWPK6-10
13	C 1-12	SWPK2-6
14	C 1-13	SWPK2-8
15	C 1-15	SWPK2-10
16	C 1-10	SWPK3-6
17	C 1-35	SWPK3-8
18	C 1-11	SWPK3-10
19	C 1-4	SWPK5-6
20	C 1-5	SWPK5-8

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21	C 1-6	SWPK5-10
22	C 1-7	SWPK4-6
23	C 1-8	SWPK4-8
24	C 1-9	SWPK4-10

FIELD TERMINAL ASSIGNMENTS

<u>POS</u>	<u>CONN.</u>	<u>POS</u>	<u>CONN.</u>	<u>POS</u>	<u>CONN</u>
101	SWPK1-R	111	SWPK3-R	121	SWPK5-R
102	SWPK1-Y	112	SWPK3-Y	122	SWPK5-Y
103	SWPK1-G	113	SWPK3-G	123	SWPK5-G
104	SWPK2-R	114	SWPK4-R	124	SWPK6-R
105	SWPK2-Y	115	SWPK4-Y	125	SWPK6-Y
106	SWPK2-G	116	SWPK4-G	126	SWPK6-G